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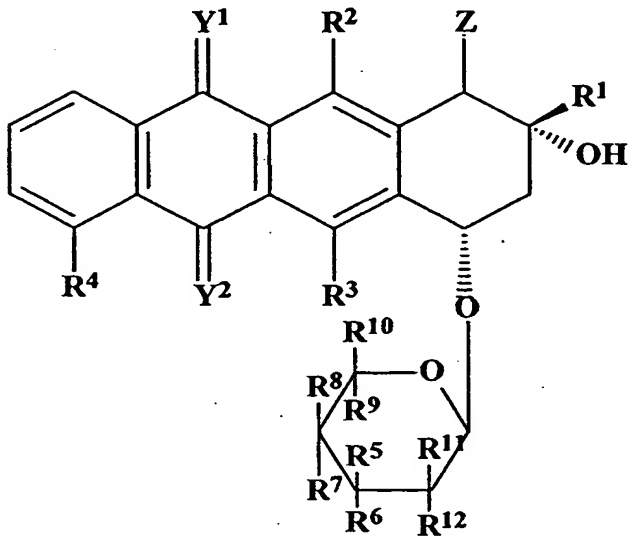
CLAIMS:

1. A substituted anthracycline having the formula:



wherein, R^1 denotes any suitable group or combination of groups that form but are not limited to a nucleic acid intercalator or binding compound; a topoisomerase inhibitor, including but not limited to, an alkyl chain; a ($-COCH_2R^{13}$) group; or a C(OH)-CH_2R^{13});

wherein, R^{13} is a hydrogen (-H) group or a hydroxyl group (-OH); a methoxy group ($-OCH_3$); an alkoxy group having 1-20 carbon atoms; an alkyl group having 1-20 carbon atoms; an aryl group having 1-20 carbon atoms; a fatty acyl group having the general structure $-O-CO(CH2)_nCH_3$, wherein n = an integer from 1 to about 20; or a fatty acyl group having the general structure -O-$CO(CH2)_l(CH=CH)_m(CH2)_nCH_3$, wherein l is an integer between 1 to 3, m is an integer between 1 and about 6, and n is an integer between 1 to about 9; or a chain(R) such as $-OCO-(CH_2)_n-CH_2NH_2$; or $OCO-(CH_2)_n-CO_2H$ and its salts.

each of R^2 and R^3 is, independently of the other, a hydrogen (-H), a hydroxyl group (-OH); a methoxy group ($-OCH_3$);

R^4 is a hydrogen (-H) group; a methoxy group ($-OCH_3$); a hydroxyl group (-OH); or a halide;

each of Y^1 and Y^2 is, independently of the other, a double bonded oxygen, sulphur, or nitrogen atom;

Z is a -H; -OH; a $-CO_2H$ group; or a $-CO_2R$ group;

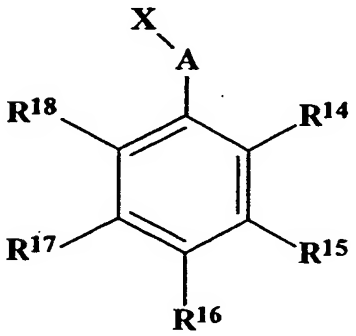
R^7, R^8, are, independently, -H; -OH; a halide; $-OR^{19}$; -SH; $-SR^{19}$; $-NH_2$; $-NHR^{19}$; $-N(R^{19})_2$; $-CH_3$; and R^7 can additionally be a saccharide; wherein R^{19} is an alkyl chain; an alkylating moiety; a cycloalkyl chain; a cyclic ring; or a hydrogen;

R^9 can be -H; $-CH_3$; alkyl; aryl; CH_2OH, CH_2F;

R^{10}, R^{11} and R^{12} are, independently, -H; -OH; a halide; -OR; -SH; -SR; $-NH_2$; -NHR; $-N(R)_2$; $-CH_3$;

one of R^5 and R^6 is a -H;

one of R^5 and R^6 is a X-alkyl-aromatic-ring (AAR) substituent such as -XAAR, wherein, A is an alkyl group and wherein, AR is an substituted phenyl ring; or a substituted five-member ring; or a heteroatomic five-member ring; or a heteroatomic six-member ring such as a pyridine ring; of the form;



; wherein, R^{14} -R^{18} are independently a (-H) group; a hydroxyl group (-OH); a methoxy group ($-OCH_3$); a nitro group ($-NO_2$), an amine group ($-NH_2$), a halide; an

alkoxy group having 1-20 carbon atoms; an alkyl group having 1-20 carbon atoms; an aryl group having 1-20 carbon atoms; an alkyl-amino group; an alkyl-thio group; a cyano group (CN, SCN); an $-CO_2H$ group; an $-CO_2R$ group; and

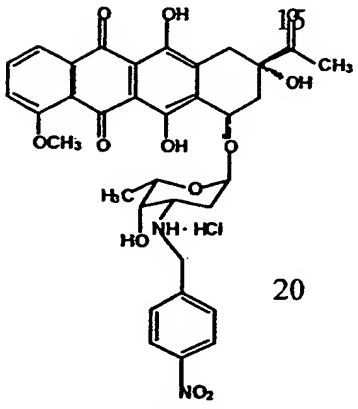
the aromatic ring may be disubstituted, trisubstituted, tetrasubstituted or pentasubstituted; and

X is a -O, -N or -S, or -SO, or $-SO_2$ group; and

A is $(CH_2)_n$ where n = 0-10;

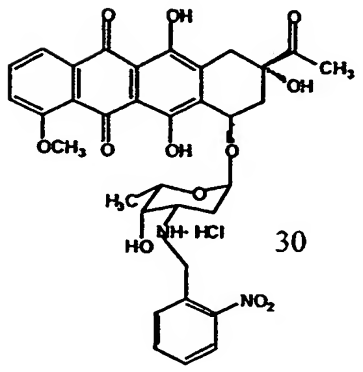
wherein, if R^5 is a XAAR substituent R^6 is not and if R^6 is a XAAR substituent R^5 is not.

2. The compound of claim 1 comprising the structure:



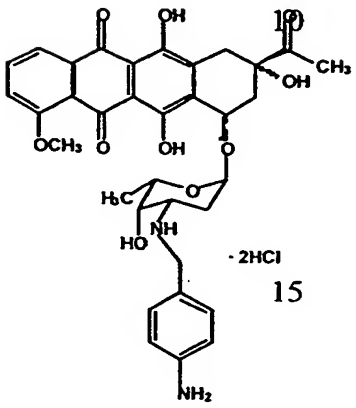
WP755

3. The compound of claim 1 comprising the structure:



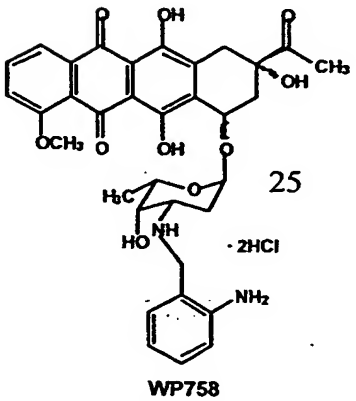
WP756

4. The compound of claim 1 comprising the structure:



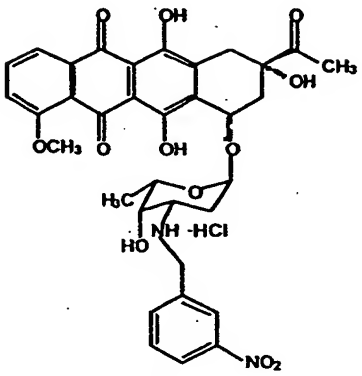
WP757

5. The compound of claim 1 comprising the structure:



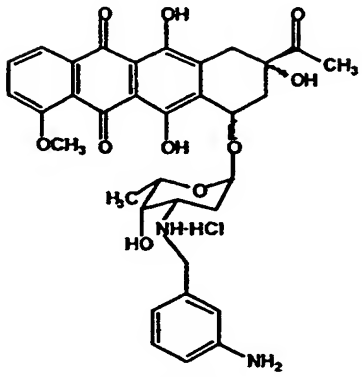
WP758

6. The compound of claim 1 comprising the structure:



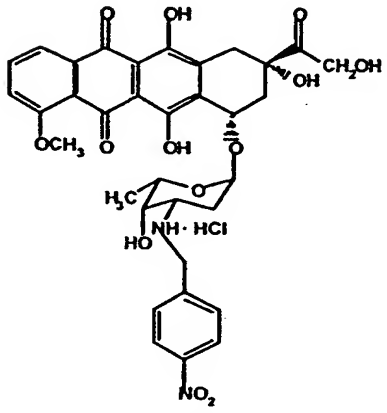
WP784

7. The compound of claim 1 comprising the structure:



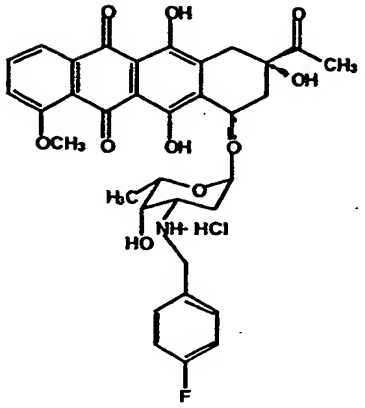
WP785

8. The compound of claim 1 comprising the structure:



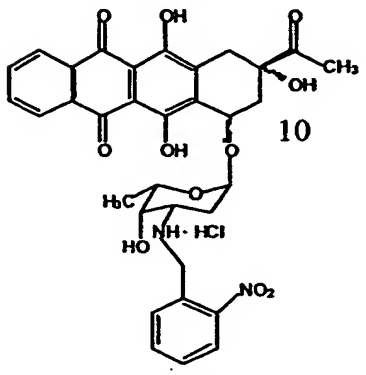
WP765

9. The compound of claim 1 comprising the structure:



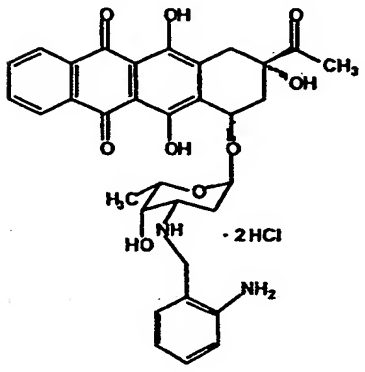
WP786

10. The compound of claim 1 comprising the structure:



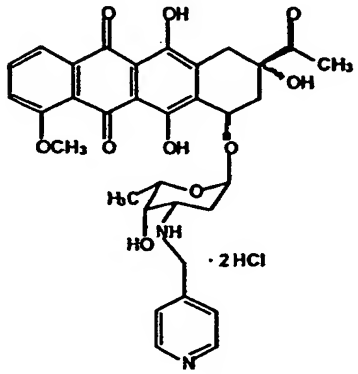
WP790

11. The compound of claim 1 comprising the structure:



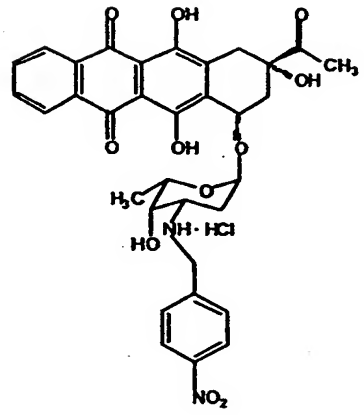
WP791

12. The compound of claim 1 comprising the structure:



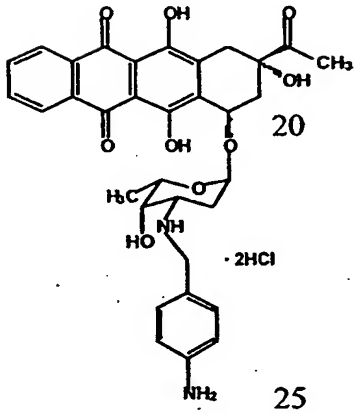
WP831

13. The compound of claim 1 comprising the structure:



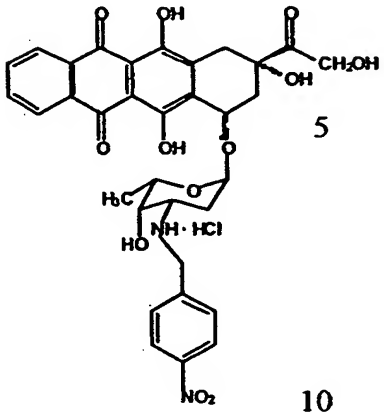
WP774

14. The compound of claim 1 comprising the structure:



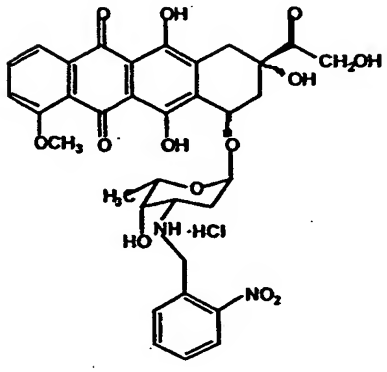
WP775

15. The compound of claim 1 comprising the structure:



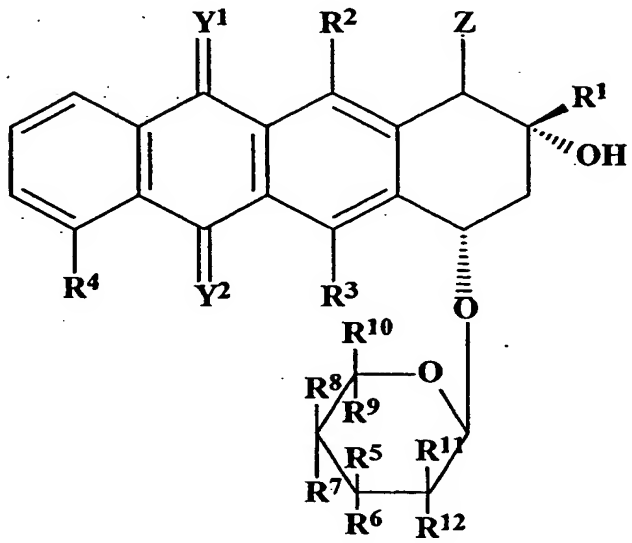
WP778

16. The compound of claim 1 comprising the structure:



WP780

17. A substituted anthracycline having the formula:



wherein, R^1 denotes any suitable group or combination of groups that form but are not limited to a nucleic acid intercalator or binding compound; a topoisomerase inhibitor, including but not limited to, an alkyl chain; a ($-COCH_2R^{13}$) group; or a C(OH)-CH_2R^{13});

wherein, R^{13} is a hydrogen (-H) group or a hydroxyl group (-OH); a methoxy group ($-OCH_3$); an alkoxy group having 1-20 carbon atoms; an alkyl group having 1-20 carbon atoms; an aryl group having 1-20 carbon atoms; a fatty acyl group having the general structure -O-CO(CH2)$_n$CH$_3$, wherein n = an integer from 1 to about 20; or a fatty acyl group having the general structure -O-CO(CH2)$_l$(CH=CH)$_m$(CH2)$_n$CH$_3$, wherein l is an integer between 1 to 3, m is an integer between 1 and about 6, and n is an integer between 1 to about 9; or a chain(R) such as -OCO-$(CH_2)_n$-CH_2NH_2 ; or OCO-$(CH_2)_n$-CO_2H and its salts.

each of R^2 and R^3 is, independently of the other, a hydrogen (-H), a hydroxyl group (-OH); a methoxy group ($-OCH_3$);

R^4 is a hydrogen (-H) group; a methoxy group ($-OCH_3$); a hydroxyl group (-OH); or a halide;

each of Y^1 and Y^2 is, independently of the other, a double bonded oxygen, sulphur, or nitrogen atom;

Z is a -H; -OH; a $-CO_2H$ group; or a $-CO_2R$ group;

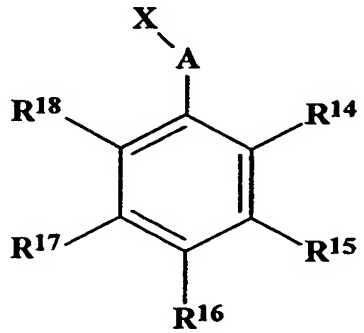
R^5, R^6, are, independently, -H; -OH; a halide; $-OR^{19}$; -SH; $-SR^{19}$; $-NH_2$; $-NHR^{19}$; $-N(R^{19})_2$; $-CH_3$; and R can additionally be a an alkylating moiety; wherein R^{19} is an alkyl chain; an alkylating moiety; a cycloalkyl chain; a cyclic ring; a hydrogen;

R^9 can be -H; $-CH_3$; alkyl; aryl; CH_2OH, CH_2F;

R^{10}, R^{11} and R^{12} are, independently, -H; -OH; a halide; -OR; -SH; -SR; $-NH_2$; -NHR; $-N(R)_2$; $-CH_3$;

one of R^7 and R^8 is a -H;

one of R^7 and R^8 is a X-alkyl aromatic-ring (AAR) substituent such as -XAAR, wherein, A is an alkyl group and wherein, AR is an unsubstituted phenyl ring; or a substituted phenly ring; or a substituted five-member ring such as a pyridine ring; or a heteroatomic five-member ring, of the general form;



; wherein, R^{14}-R^{18} are independently a (-H) group; a hydroxyl group (-OH); a methoxy group ($-OCH_3$); a nitro group ($-NO_2$), an amine group ($-NH_2$), a halide; an alkoxy group having 1-20 carbon atoms; an alkyl group having 1-20 carbon atoms; an aryl group having 1-20 carbon atoms; an alkyl-amino

group; an alkyl-thio group; a cyano group (CN, SCN); an $-CO_2H$ group; an $-CO_2R$ group; and

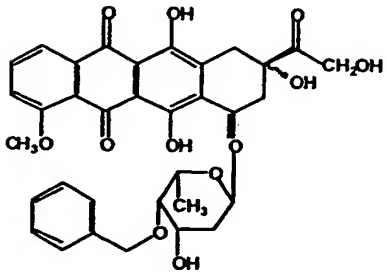
the aromatic ring may be disubstituted, trisubstituted, tetrasubstituted or pentasubstituted; and

X is a -O, -N or -S, or -SO, or $-SO_2$ group; and

A is $(CH_2)_n$ where n = 0-10;

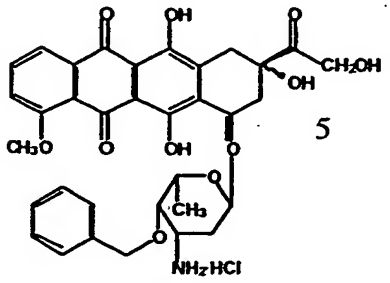
wherein if R^7 is a XAAR substituent R^8 is not and if R^8 is a XAAR substituent R^7 is not.

18. The compound of claim 17 comprising the structure:



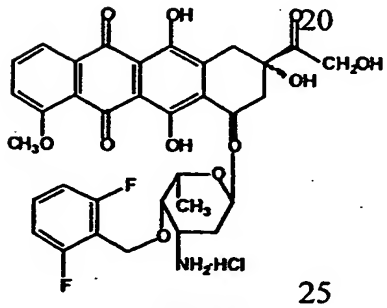
WP727

19. The compound of claim 17 comprising the structure:



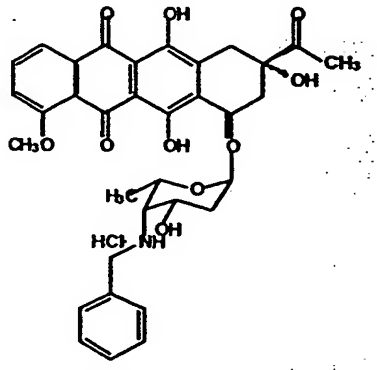
WP744

20. The compound of claim 17 comprising the structure:



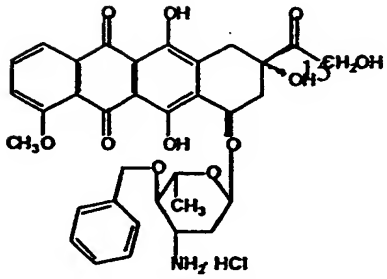
WP799

21. The compound of claim 17 comprising the structure:



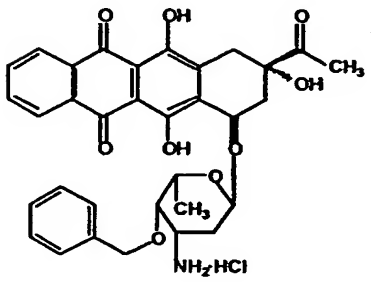
WP787

22. The compound of claim 17 comprising the structure:



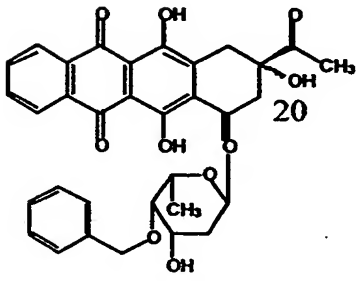
WP750

23. The compound of claim 17 comprising the structure:



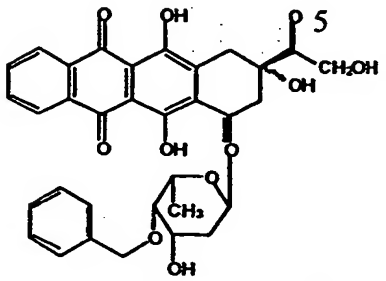
WP783

24. The compound of claim 17 comprising the structure:



WP793

25. The compound of claim 17 comprising the structure:



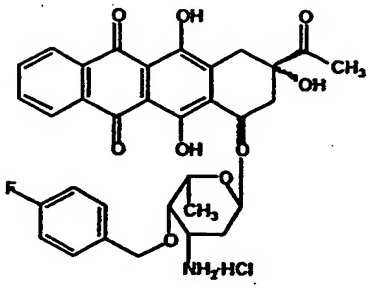
WP794

10

15

26. The compound of claim 17 comprising the structure:

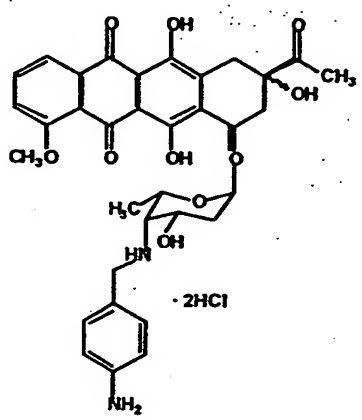
20



WP797

25

27. The compound of claim 17 comprising the structure:



WP764

28. The method for the synthesis of 4'-O-benzylated sugars comprising glycals as starting material for the preparation of 3-azido and 3-O-blocked glycosyl donors benzylated at C-4.

29. The method for synthesis of 4-O-alkylated glycals blocked and unblocked at C-3 comprising of direct and selective alkylation by an alkylating agent at C-4 of acylated glycals exemplified but not limited to 3,4-di-O-acetyl-L-rhamnal, 3,4-di-O-acetyl-L-fucal, 3,4,6-tri-O-acetyl-D-glucal and 3,4,6-tri-O-acetyl-D-galactal.

30. The method of claim 29, where said alkylating agent is benzyl chloride.

31. The method of claim 29, where said alkylating agent is benzyl bromide.

32. The method for the synthesis of amine containing anthracyclines comprising using a substituted sugar azide, wherein the azido substitution can be at the 1', 2', 3', 4' or 5' position on the sugar, said azide serving as a masked and neutral form of amine substituent, allowing for the subsequent coupling reaction and selectivity.

33. The method of claim 32 wherein the amine containing anthracycline is a 14-hydroxy analog of anthracyclines.

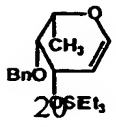
34. The method of claim 32 wherein the amine containing anthracycline is an analog of doxorubicin.

35. The method of claim 32 wherein the amine containing anthracycline is an analog of daunorubicin.

36. The method of claim 32 wherein the amine containing anthracycline is WP744.

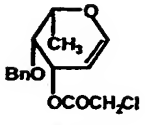
37. The method of claim 32 wherein the amine containing anthracycline is WP769.

38. A sugar comprising the structure:



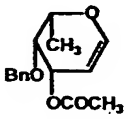
WP735

39. A sugar comprising the structure:



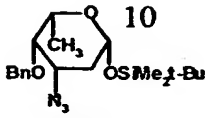
WP736

40. A sugar comprising the structure:



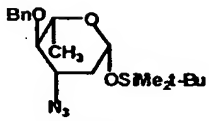
WP567

41. A sugar comprising the structure:



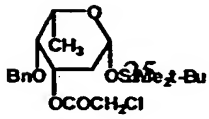
WP819

42. A sugar comprising the structure:



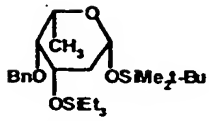
WP820

43. A sugar comprising the structure:



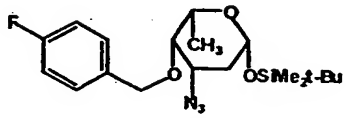
WP821

44. A sugar comprising the structure:



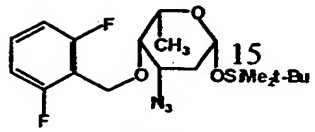
WP822

45. A sugar comprising the structure:



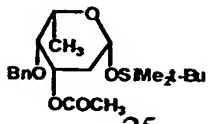
WP823

46. A sugar comprising the structure:



WP824

47. A sugar comprising the structure:



WP825